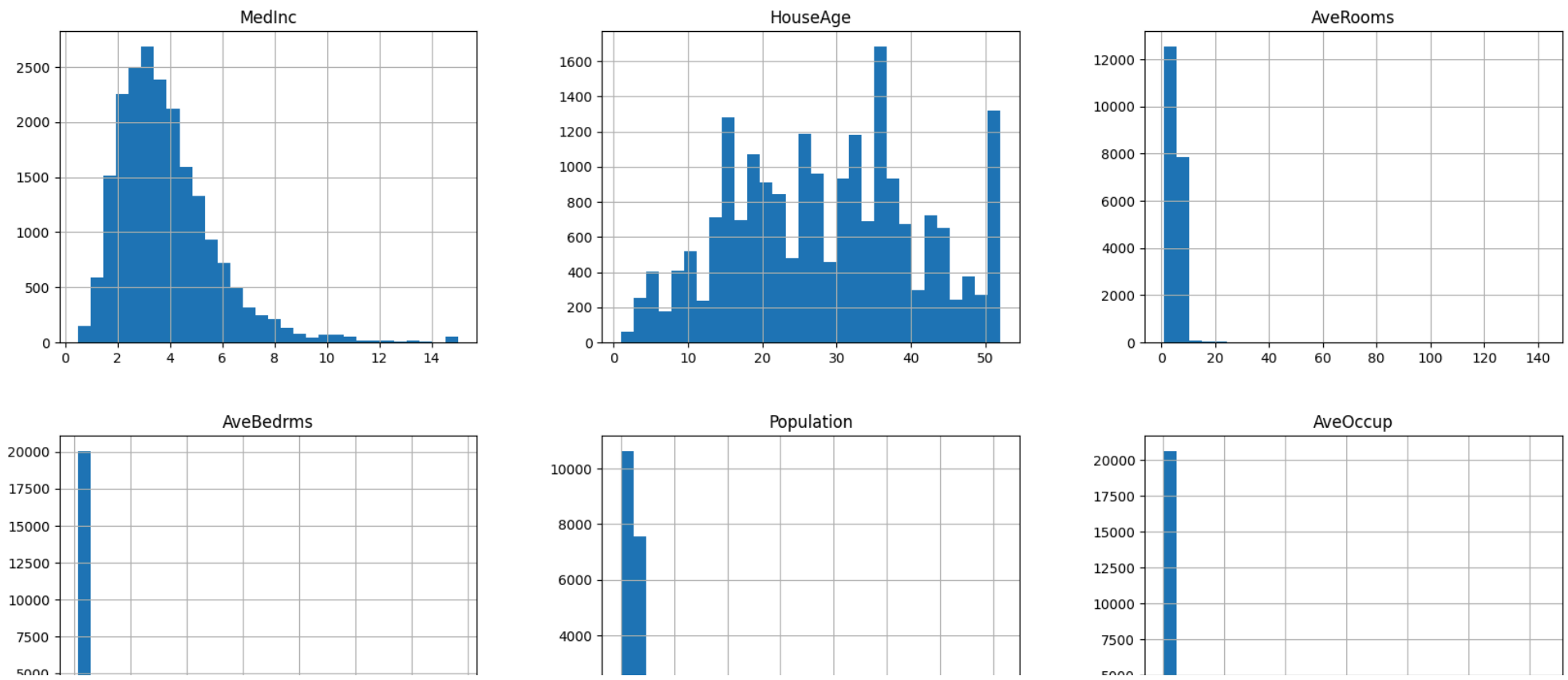
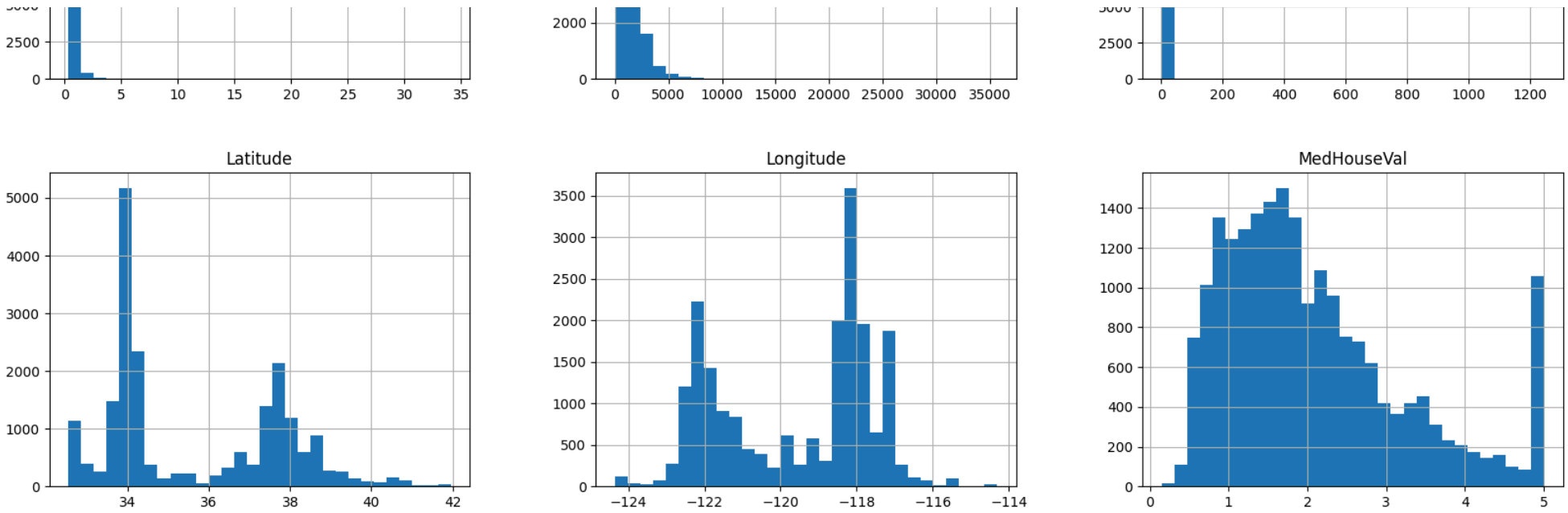
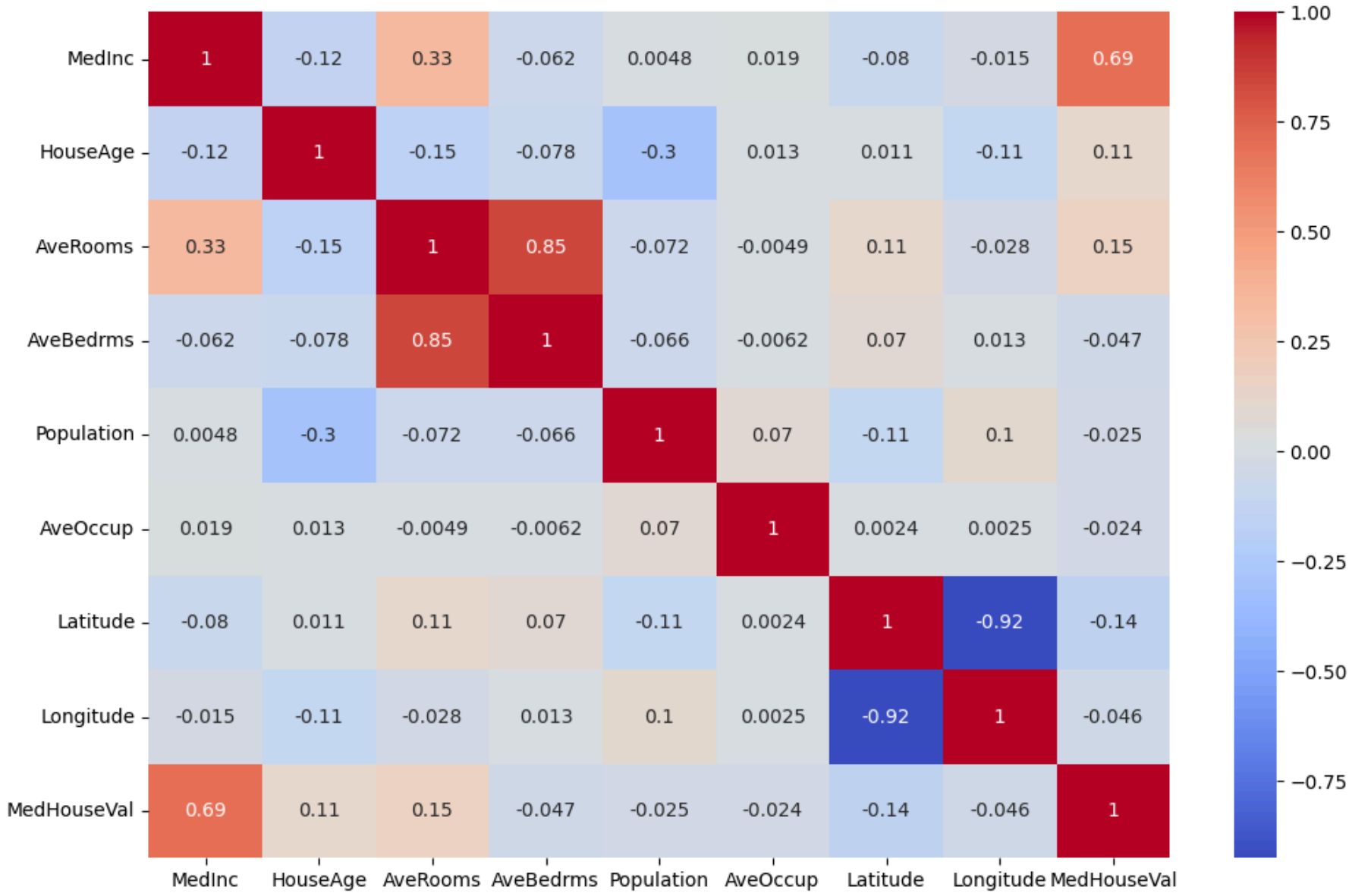
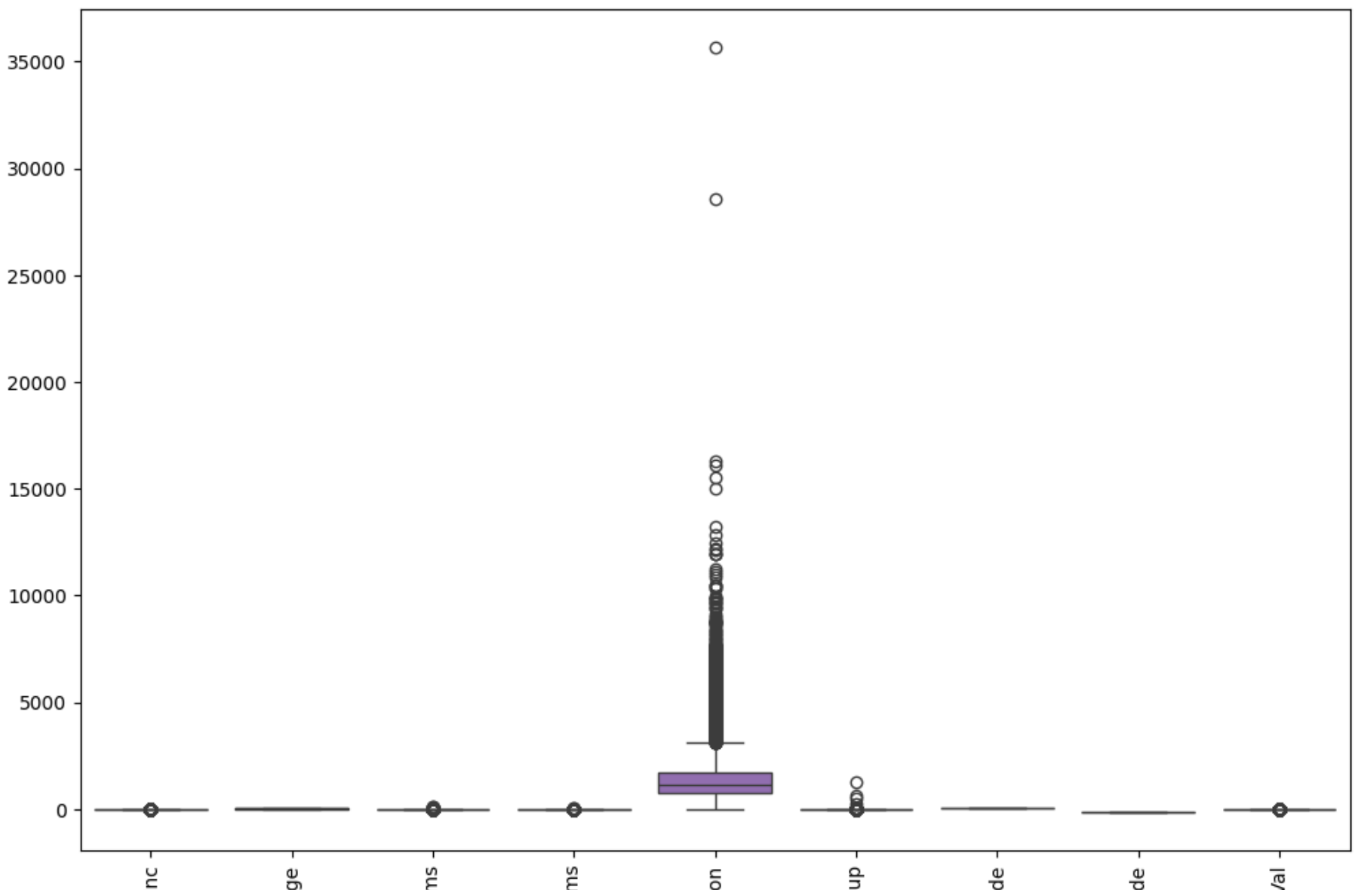
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.datasets import fetch_california_housing

# Load the dataset
data = fetch_california_housing()
df = pd.DataFrame(data.data, columns=data.feature_names)
df['MedHouseVal'] = data.target

# Display the first few rows
print(df.head())

# Basic Data Inspection
# Dataset shape
print("Shape of the dataset:", df.shape)

# Data types and missing values
print("\nData types and missing values:")
print(df.dtypes)
print(df.isnull().sum())

# Data Cleaning
# Check for missing values
missing_values = df.isnull().sum()
print("\nMissing values in each column:\n", missing_values)

# Exploratory Data Analysis (EDA)
# Summary Statistics
print("\nSummary statistics:")
print(df.describe(include='all'))

# Distribution Analysis
# Plot histograms for all numerical features
df.hist(bins=30, figsize=(20, 15))
plt.show()

# Correlation Analysis
# Compute the correlation matrix
correlation_matrix = df.corr()

# Plot the heatmap
plt.figure(figsize=(12, 8))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm')
plt.show()

# Outlier Detection
# Box plot for outlier detection
plt.figure(figsize=(12, 8))
sns.boxplot(data=df)
plt.xticks(rotation=90)
plt.show()

# Visualization
# Histograms
# Histogram for 'MedHouseVal'
plt.figure(figsize=(10, 6))
sns.histplot(df['MedHouseVal'], bins=30, kde=True)
plt.title('Distribution of Median House Value')
plt.show()

# Scatter Plots
# Scatter plot of 'AveRooms' vs 'MedHouseVal'
plt.figure(figsize=(10, 6))
sns.scatterplot(x='AveRooms', y='MedHouseVal', data=df)
plt.title('Average Rooms vs Median House Value')
plt.show()

# Heatmaps
# Heatmap of the correlation matrix
plt.figure(figsize=(12, 8))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm')
plt.title('Heatmap of Feature Correlations')
plt.show()
```

```
   MedInc  HouseAge  AveRooms  AveBedrms  Population  AveOccup  Latitude  \
0  8.3252      41.0  6.984127   1.023810       322.0  2.555556     37.88
1  8.3014      21.0  6.238137   0.971880      2401.0  2.109842     37.86
2  7.2574      52.0  8.288136   1.073446       496.0  2.802260     37.85
3  5.6431      52.0  5.817352   1.073059       558.0  2.547945     37.85
4  3.8462      52.0  6.281853   1.081081       565.0  2.181467     37.85

   Longitude  MedHouseVal
0    -122.23        4.526
1    -122.22        3.585
2    -122.24        3.521
3    -122.25        3.413
4    -122.25        3.422
Shape of the dataset: (20640, 9)

Data types and missing values:
MedInc         float64
HouseAge       float64
AveRooms       float64
AveBedrms      float64
Population     float64
AveOccup       float64
Latitude       float64
Longitude      float64
MedHouseVal    float64
dtype: object
MedInc         0
HouseAge       0
AveRooms       0
AveBedrms      0
Population     0
AveOccup       0
Latitude       0
Longitude      0
MedHouseVal    0
dtype: int64

Missing values in each column:
 MedInc         0
HouseAge       0
AveRooms       0
AveBedrms      0
Population     0
AveOccup       0
Latitude       0
Longitude      0
MedHouseVal    0
dtype: int64

Summary statistics:
             MedInc      HouseAge      AveRooms     AveBedrms    Population  \
count  20640.000000  20640.000000  20640.000000  20640.000000  20640.000000
mean       3.870671     28.639486      5.429000      1.096675   1425.476744
std        1.899822     12.585558      2.474173      0.473911   1132.462122
min        0.499900      1.000000      0.846154      0.333333      3.000000
25%        2.563400     18.000000      4.440716      1.006079    787.000000
50%        3.534800     29.000000      5.229129      1.048780   1166.000000
75%        4.743250     37.000000      6.052381      1.099526   1725.000000
max       15.000100     52.000000    141.909091     34.066667  35682.000000

           AveOccup      Latitude     Longitude   MedHouseVal
count  20640.000000  20640.000000  20640.000000  20640.000000
mean       3.070655     35.631861   -119.569704      2.068558
std       10.386050      2.135952      2.003532      1.153956
min        0.692308     32.540000   -124.350000      0.149990
25%        2.429741     33.930000   -121.800000      1.196000
50%        2.818116     34.260000   -118.490000      1.797000
75%        3.282261     37.710000   -118.010000      2.647250
max     1243.333333     41.950000   -114.310000      5.000010
```

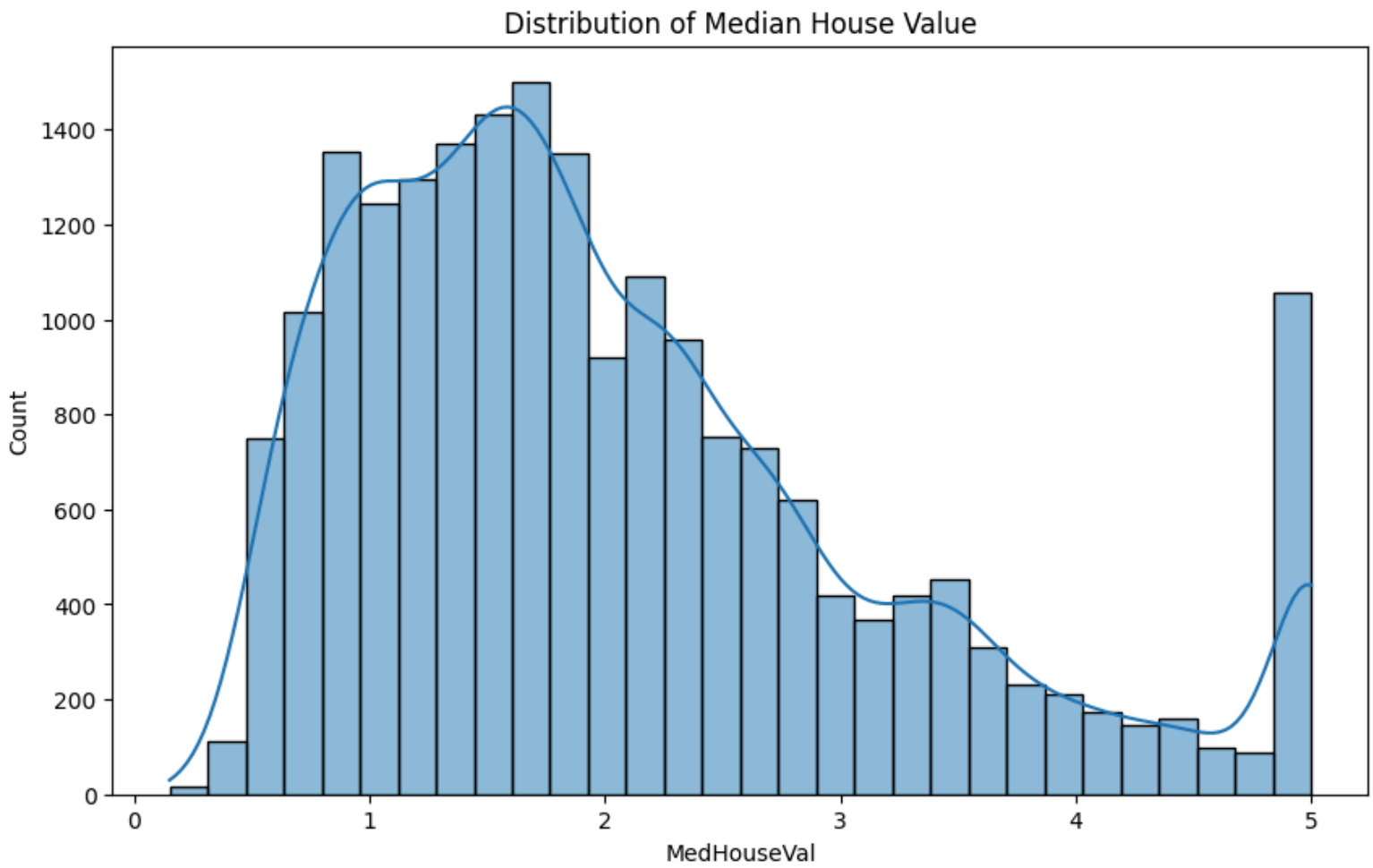


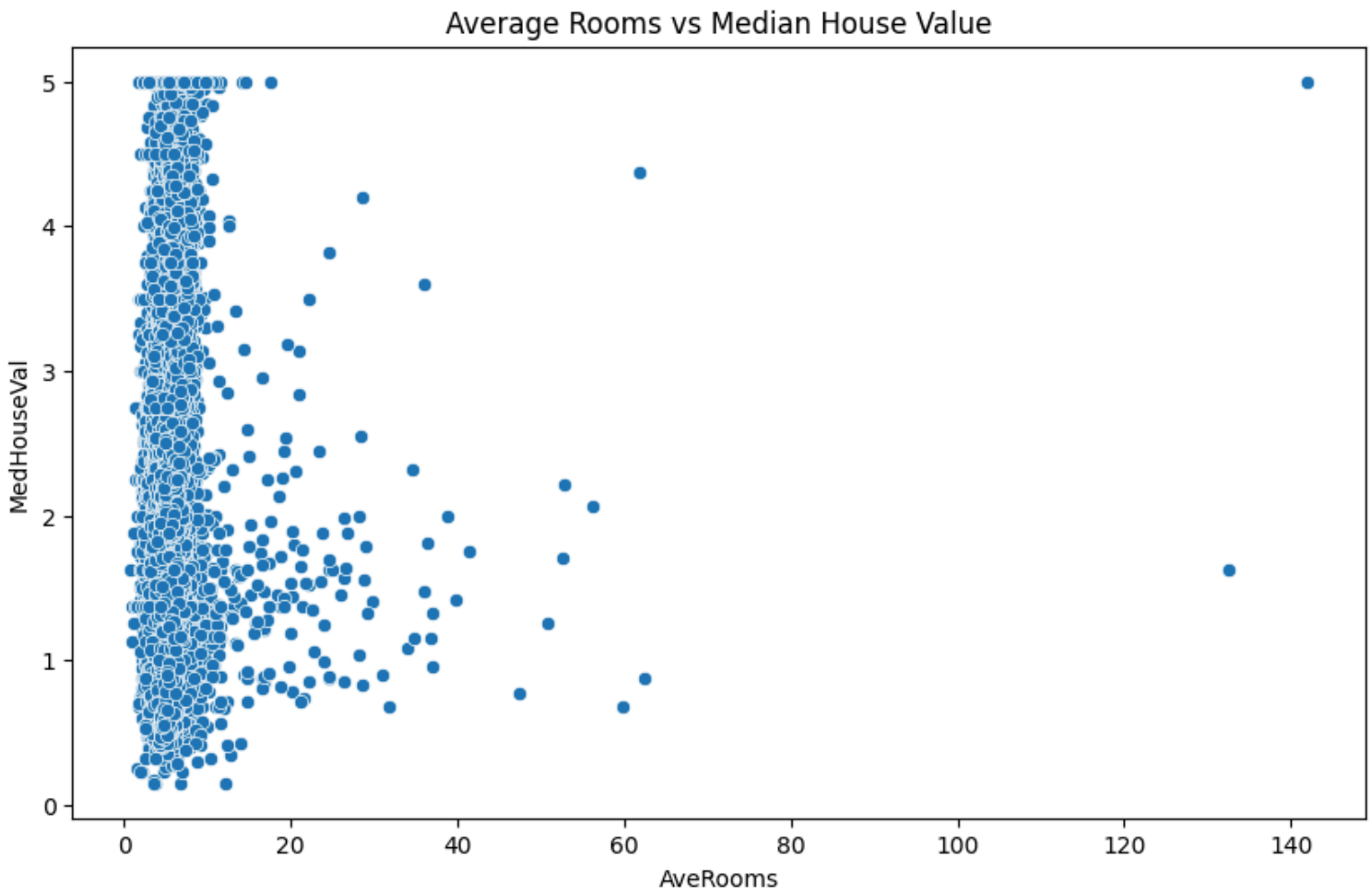

Latitude
Longitude
MedHouseVal

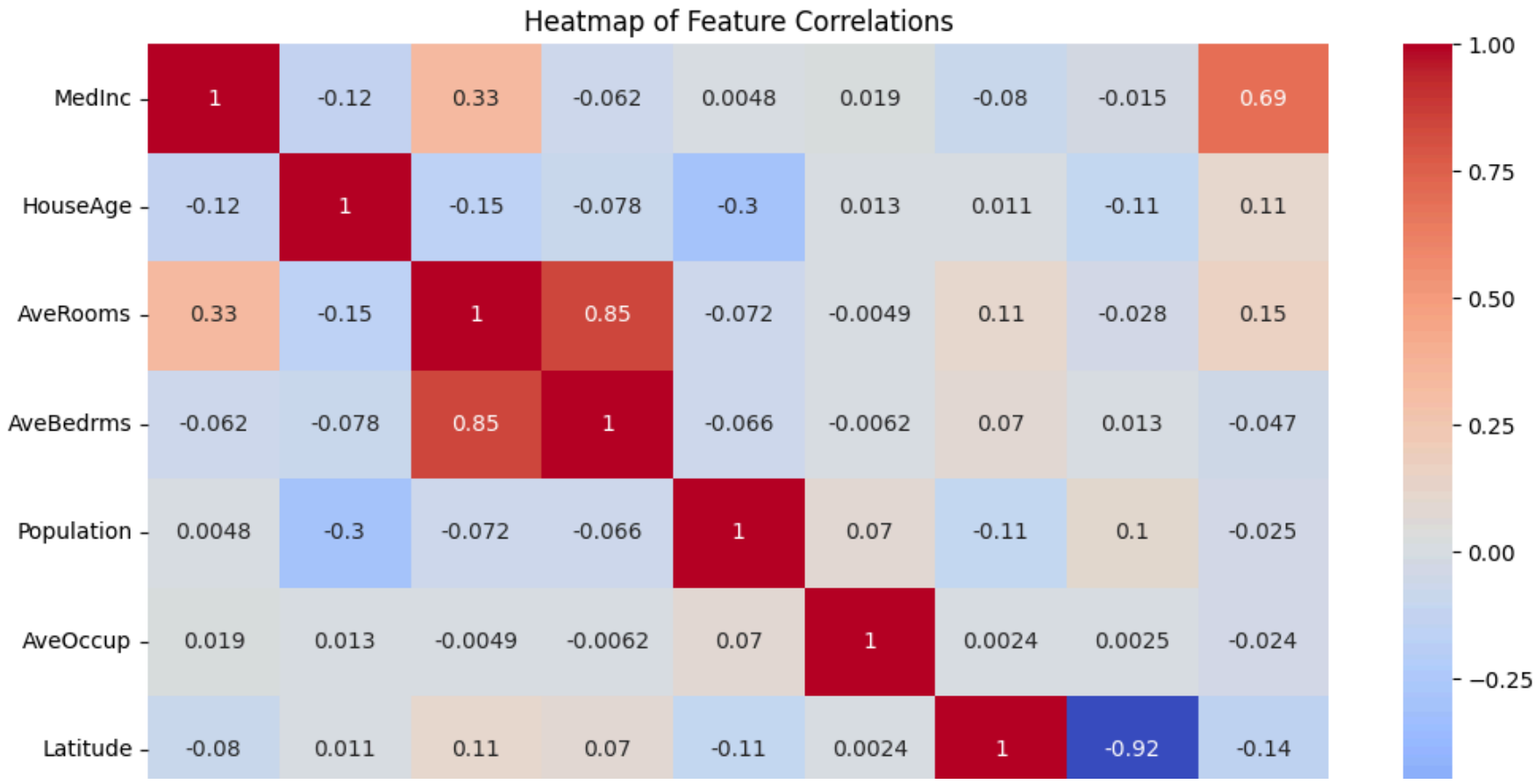

MedInc 1 -0.12 0.33 -0.062 0.0048 0.019 -0.08 -0.015 0.69
HouseAge -0.12 1 -0.15 -0.078 -0.3 0.013 0.011 -0.11 0.11
AveRooms 0.33 -0.15 1 0.85 -0.072 -0.0049 0.11 -0.028 0.15
AveBedrms -0.062 -0.078 0.85 1 -0.066 -0.0062 0.07 0.013 -0.047
Population 0.0048 -0.3 -0.072 -0.066 1 0.07 -0.11 0.1 -0.025
AveOccup 0.019 0.013 -0.0049 -0.0062 0.07 1 0.0024 0.0025 -0.024
Latitude -0.08 0.011 0.11 0.07 -0.11 0.0024 1 -0.92 -0.14
Longitude -0.015 -0.11 -0.028 0.013 0.1 0.0025 -0.92 1 -0.046
MedHouseVal 0.69 0.11 0.15 -0.047 -0.025 -0.024 -0.14 -0.046 1
MedInc HouseAge AveRooms AveBedrms Population AveOccup Latitude Longitude MedHouseVal
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75



MedI HouseA AveRoo AveBedr Populati AveOcc Latitu Longitu MedHouse\








Longitude
MedHouseVal
-0.015
-0.11
-0.028
0.013
0.1
0.0025
-0.92
1
-0.046
0.69
0.11
0.15
-0.047
-0.025
-0.024
-0.14
-0.046
1
MedInc
HouseAge
AveRooms
AveBedrms
Population
AveOccup
Latitude
Longitude
MedHouseVal
−0.50
−0.75